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## IX.3 Hydrogen/Alternative Energy Center\*

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Contract Number: DE-FC36-04GO14218

Start Date: November 2005

Projected End Date: December 31, 2006

\*Congressionally directed project

exchange of information; August development program planned

- T.2 – Faculty-to-faculty training across MI
  - Exploring use of interactive television to complete
- T.3 – Increased awareness of hydrogen education programs through conference presentations
  - Numerous meetings/presentations/media pitches completed
  - Greater Lansing Economic Club presentation planned for November 2006
- T.3 – Increased awareness through comprehensive public relations outreach program
  - Completing print collateral/website development
  - Created a portable display unit
  - Sponsored an alternative energy day at the state capital
  - Drafted resolution language for Governor of Michigan to declare September 21, 2005 as Alternative Energy Day in Michigan
  - Held press conference announcing partnership between Clean Cities and Lansing Community College (LCC)
  - Provided one day conference to educate people in the use of alternative fuels in busses and vehicle fleets
  - Numerous media stories
- T.4 – Hydrogen safety plan/safety readiness review with DOE participation
  - First draft completed; finalizing plan with feedback from DOE
- T.4 – Creation/operation of instructional laboratory
  - Equipment installed; final details to be completed by August 2006
- T.5 – Quarterly technical progress reports

### Technical Barriers

This project addresses the following technical barriers from the Education section (3.8.4.1) of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan:

- (A) Lack of Awareness.
- (B) Lack of Demonstrations or Examples of Real World Use.
- (C) Institutional Barriers and Access to Audiences.
- (D) Regional Differences

### Accomplishments

- T.1 – Alternative Energy Technician Program
  - Developed Alternative Energy Engineering Technician (AEET) degree; first courses offered Spring 2005
- T.1 – Hydrogen modules integrated across Tech curriculum
  - Integration of hydrogen and alternative energy elements in academic programs in all three Technical Careers departments completed
- T.2 – LCC Tech Careers Faculty professional development; four programs
  - Faculty currently attending conferences, workshops; Met with SUNY Delhi faculty for

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### Introduction

Lansing Community College's alternative energy initiative aims to support the DOE's educational efforts to raise awareness about the effectiveness and importance of embracing hydrogen as a viable energy source. LCC's project focuses on creating an associate's degree program to train a workforce as alternative energy engineering technicians capable of entering the workforce or transferring to a four year program.

A complementing strategy is to expose all students in a technical career program to hydrogen and alternative energy concepts.

Completing the educational strategy of the DOE supported project are efforts to construct and equip operating instructional laboratories so that students and the public can better understand how a fuel cell operates and a public outreach campaign to raise general awareness about hydrogen and alternative fuels.

## Approach

LCC has adopted a comprehensive, college-wide approach that integrates hydrogen fuel cell and alternative energy concepts into many technical career programs as well as enhancing the instructional facilities so that students and the public can have easy access to seeing, using and understanding the mechanics of alternative fuel technology.

## Results

### Curriculum Development/Instructional Support

- Creation of Alternative Energy Engineering Technician Associate's Degree (see Table 1)
  - 2+2 Transfer Program with Partner Colleges & Universities
  - Lawrence Institute of Technology
  - Wayne State University
  - University of Michigan, Ann Arbor

TABLE 1. AEET Curriculum

AEET Requirements		Total Credits: 67
Code	Title	Credit Hours
AEET 102	Prin of Alt/Renewable Energies	3
AEET 110	Conventional Energy Sources/Use	3
AEET 115	Geothermal Technology	3
AEET 116	Solar Energy Technology	3
AEET 117	Biomass, Biogas and Microtur Tech	3
AEET 118	Fuel Cell & Hydrogen Tech	3
AEET 119	Wind Energies	3
AEET 200	Energy Site Evaluation	3
AEET 220	Energy Efficiency & Management	3
AEET 250	Alt Energy Inventory & Analysis	3
AEET 251	Planning & Design	3
AEET 252	Alt Energy Implement/Maintenance	3
AEET 260	Codes, Regulations & Standards	3

\*Other prerequisite courses are required to complete the curriculum 28

- Kettering University, formerly GM Institute
- Integration of alternative energy concepts into following programs:
  - Architecture
  - Residential Building
  - Civil Technology
  - Alternative Energy
  - Interior Design
- Alternative Energy Lab equipment received; anticipate August 2006 completion
- Advanced Vehicle/Automotive Technology Program Results
  - Faculty Training/Workshops
  - Hydrogen Safety Plan for LCC underway; close to completion
  - Hydrogen Powered Engine in development
  - Hydrogen Engine Lab in development
  - Hydrogen Modules for Automotive Courses in development
  - Fuel Cell Golf Cart completed
  - Hybrid vehicle purchased/integrated into curriculum
  - Demonstration truck/trailer purchased

### Faculty Development

- Professional development faculty training and workshops identified and faculty attending
- Sponsored alternative energy programs at LCC

### Samples of Conferences Attended FY 2006

1. GLREA Energy – October 2005 (faculty attended)
2. Houses that Work (Several Faculty & Alternative Energy Students) November 2005 (faculty attended)
3. SEMA Conference Las Vegas, October/November 2005 (faculty attended)
4. Fuel Cell Durability Conference, Washington, DC December 2005 (faculty attended)
5. Reinvention 2005: Greening The American Home Conference, Coral Gables, Florida, December 2005 (faculty attended)
6. 2006 Hybrid Vehicle Symposium, San Diego, CA, February 2006 (faculty attended)
  - National Association of State Energy Officials, Washington, DC, 2006 Energy Outlook Conference February 2006
7. MHA Annual Hydrogen Conference, March 2006, Long Beach, CA

8. Hydrogen Expo USA and National Hydrogen Association's Annual Conference, March 2006, Long Beach, CA
9. Hydrogen Expo USA March 2006
10. Globalcon 2006 Energy & Facilities Management Conference and Expo March 2006
11. International Conference on Hydrogen and Fuel Cells Conference April 2006
12. Advanced Energy LCC/SUNY Delhi – May 2006

#### Outreach/Public Awareness

##### Key Contacts

- General Motors Knowledge Center
- Numerous educational institutions
- State of Michigan
- American Association of Community Colleges
- Association of Community College Trustees
- Michigan NextEnergy
- Michigan Community Colleges
- Central Michigan Sustainability Council
- Montana Tech
- Michigan Economic Development Corporation
- Michigan Department of Environmental Quality
- State of Michigan EDGE 2 initiative
- Lansing Rotary
- Society of Automotive Engineers
- Public relations plan completed and implemented
- Web site developed
- Print materials developed
- State Capital Alternative Energy Day September 21, 2005
- Grand Opening of greenhouse

#### Conclusions and Future Directions

- Conclusions
  - The public is interested in learning more about the feasibility of alternative fuels but general knowledge and understanding is very limited.
  - Students have difficulty envisioning alternative energy careers and thus demonstrate some reluctance to enrolling and committing to an alternative energy associate's degree.

- There is a lot of activity and interest regarding fuel cells and alternative energy among community colleges in Michigan but our collective focus remains scattered. Recent efforts by LCC and the state are making progress in creating a stateside vision.
- There is a steep learning curve among faculty and staff in understanding what is needed to construct and equip an alternative energy laboratory and integrate fuel cells into the automotive program.

##### • Future Directions

- Complete installation of Hydrogen/Alternative Energy instructional laboratories. August 2006 anticipated completion date.
- Completion of dynamometer room for automotive program's internal combustion engine. August 2006 anticipated completion date.
- Collaboration with Michigan community colleges and four year institutions to create a unified hydrogen/alternative energy educational strategy for Michigan.
- Completion of curriculum development for alternative energy segments across technical careers curriculum.
- Strategic engagement of community colleges across the country; ongoing awareness raising activities.
- Faculty development.
- Final curriculum development.
- Hydrogen internal combustion engine developed; lab, kiosk, vehicles integrated into classroom instruction.
- Expanded outreach/awareness activities.

#### FY 2006 Publications/Presentations

1. American Community College Trustees
2. MI Department of Economic Growth
3. MI Department of Career Development Governor's Conference
4. Edge 2 project (MI Governor's Office)
5. MI Department of Environmental Quality
6. DOE Hydrogen Review Conference